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Proceedings of the 2013 Regional Peer Review of the Recovery Potential Assessment for Smooth Skate (*Malacoraja senta*) – Funk Island Deep Designatable Unit

May 1-2, 2013
St. John's, Newfoundland and Labrador

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A Recovery Potential Assessment (RPA) for Smooth Skate (*Malacoraja senta*) of the Funk Island Deep Designatable Unit, was held at the Holiday Inn in St. John's, Newfoundland and Labrador on May 1-2, 2013. This skate population was designated as *Endangered* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in May 2012. Although it is not currently listed under the *Species at Risk Act* (SARA), Fisheries and Oceans Canada (DFO) is the responsible jurisdiction should a listing occur. This RPA was conducted to inform the Minister with scientific advice and recommendations and to assist with the development of any future recovery strategies and action plans. The information generated will be used to support decisions regarding the issuance of permits, agreements and related conditions and also to update existing Smooth Skate scientific advice produced by DFO.

Participants at the meeting (Appendix 2) included representatives from DFO Science, Species at Risk, and the Fisheries and Aquaculture Management Branch, external reviewers, and a member of COSEWIC/Marine Fishes Species Survival Commission of the IUCN.

In addition to these proceedings, publications to come from the meeting include a Science Advisory Report and a comprehensive Research Document, all to be available online on the DFO Canadian Science Advisory Secretariat Website.

Compte rendu de la réunion régionale d'examen par les pairs de 2013 sur l'évaluation du potentiel de rétablissement de la raie à queue de velours (*Malacoraja senta*) – Unité désignable de la fosse de l'île Funk

SOMMAIRE

Une évaluation du potentiel de rétablissement de la raie à queue de velours (*Malacoraja senta*) de l'unité désignable de la fosse de l'île Funk a été menée au Holiday Inn de St. John's (Terre-Neuve-et-Labrador) les 1er et 2 mai 2013. Cette population de raies a été désignée comme étant *en voie de disparition* par le Comité sur la situation des espèces en péril au Canada (COSEPAC) en mai 2012. Même si elle n'est pas actuellement inscrite en vertu de la *Loi sur les espèces en péril* (LEP), Pêches et Océans Canada (MPO) est l'autorité responsable en cas d'inscription. Cette évaluation du potentiel de rétablissement a été menée pour informer la Ministre à l'aide d'avis scientifiques et de recommandations et pour contribuer à l'élaboration de tout programme de rétablissement et plan d'action à venir. L'information recueillie sera utilisée pour appuyer les décisions sur la délivrance de permis, les ententes et les conditions connexes ainsi que pour mettre à jour les avis scientifiques existants sur la raie à queue de velours produits par le MPO.

Parmi les participants à la réunion (annexe 2), on comptait des représentants du Secteur des sciences du MPO, du Secteur des espèces en péril et de la Direction de la gestion des pêches et de l'aquaculture, des évaluateurs externes et un membre du Sous-comité de spécialistes des poissons marins du COSEPAC et de la Commission de survie des espèces de l'Union internationale pour la conservation de la nature (UICN).

En plus du présent compte rendu, les publications émanant de la réunion incluent un avis scientifique et un document de recherche exhaustif, qui sont tous disponibles en ligne sur le site Web du Secrétariat canadien de consultation scientifique du ministère des Pêches et des Océans.

INTRODUCTION

Research survey and fisheries bycatch data suggest that Smooth Skate (*Malacoraja senta*) are naturally divided into several discrete and discontinuous populations, which has led COSEWIC to establish several Designatable Units (DUs) for the species. In May of 2012 the Funk Island Deep DU was listed by both COSEWIC and the International Union for the Conservation of Nature (IUCN) Red List as *Endangered*.

Several trends led COSEWIC to this decision for the DU, including steep declines in abundance and distribution indices of both adult and young individuals since the early 1980s. While numbers of adults appear to have increased over the past five years, the overall abundance remains very low. These trends in abundance are matched by strong reductions in area of occupancy. There are no targeted fisheries for this species and bycatch levels are generally quite low.

This RPA meeting aimed to address multiple objectives (see Terms of Reference – Appendix 1) within the themes of assessing the current/recent status of the population, habitat use, the scope for management to facilitate recovery, scenarios for mitigation and alternatives to activities, and allowable harm. Information was presented regarding Smooth Skate biology and life history, updates on survey abundance indices, a review of fishery landings and statistics, and a Bayesian surplus production model for the species (see Agenda – Appendix 3).

PRESENTATIONS AND DISCUSSION

BIOLOGY/LIFE HISTORY AND SURVEY INDICES UPDATE

Presenter: Roanne Collins, MFSAR, DFO Science

Abstract

In 2012, COSEWIC assessed the status of Smooth Skate in Canada and classified the Funk Island Deep designatable unit (DU), in portions of NAFO Div. 2J3KL, as *Endangered*. A Recovery Potential Assessment (RPA) was required by DFO Science to further evaluate the status of this DU and to facilitate the preparation of a Recovery Strategy should this population be listed under SARA. An evaluation of species biology/life history, as well as recent trends in distribution and abundance indices from DFO fall research vessel survey data, are required as part of the RPA process.

Recruitment dynamics and natural mortality are poorly understood. Studies of species biology in other areas have revealed low fecundity, as well as sexual dimorphism, with females maturing earlier, and at smaller sizes than do males. In addition, research suggests that Smooth Skate are relatively long-lived, with a maximum observed age of 15, though models suggest a potential life span of up to 29 years. The species is found over a variety of substrates, but appears to prefer muddy bottom. In addition, it appears to have a distinct preference for a relatively narrow temperature range (1-4°C in Div. 2J3KL), which may further constrain distribution. The diet is also quite selective, consisting almost exclusively of various crustacean species, although finfishes are also consumed by the larger size classes.

Distribution and abundance indices, consisting of Area of Occupancy estimates, catch rates, and survey abundances, declined sharply during the 1980s and early 1990s, when the Engel trawl was used. Since 1995, when the Campelen trawl was introduced, these indices have varied without trend, but remained very low relative to the estimates from the early 1980s. Separation of survey data based on size revealed similar trends for the immature and mature

components of the population. Direct comparison of the two time series from the different trawls is confounded by the lack of a conversion factor for Smooth Skate, though it is understood that catchability for all size classes (especially very small skate) is greater with the Campelen trawl.

Discussion

Some confusion arose during the presentation regarding whether DFO was actually required under SARA to carry out the RPA process for a species listed by COSEWIC. It was clarified that it is not in fact a requirement under SARA but that DFO voluntarily undergoes the process to inform the Fisheries Minister's decision on whether to list a species under SARA, and to inform any further recovery strategies and action plans that would be under DFO jurisdiction should the species be listed.

The presenter noted that the life history parameters and time series presented were not specific to the Funk Island Deep DU, but were general for the species over its entire range. Participants wondered whether any Smooth Skate existed on the plateau of NAFO division 3L, and the presenter noted that records of this species are consistently absent from such shallow waters.

Discussion of the research survey indices led participants to ask whether the presence of large error bars on peak years in the data indicated that a few large sets in those years were driving estimates up. Researchers indicated that this would need to be looked into further.

Participants also wondered about the lack of data for the past year. DFO Science staff revealed that samples had been collected this year but have not yet been analyzed in the lab. They also indicated that poor catches may make the data more complicated to analyze than other years.

A question arose regarding how confidence intervals were calculated for this data. The presenter indicated that confidence intervals represented standard error of the mean. In cases where data were bootstrapped to produce estimates, no confidence intervals were calculated, as many would be so tight as to not show up on a plot.

It was pointed out that the very narrow depth and temperature ranges exhibited by the species represent a functional description of habitat for Smooth Skate. Participants discussed the possibility of critical habitat given the stark decrease in area occupied. It was noted that 'habitat' and 'critical habitat' have very different connotations under SARA.

Participants noted that no information on the critical life history traits required to define habitat is available for this DU. The notion of temperature and depth ranges being applicable to the concept of habitat was reinforced; however there is no known biological function that these specific habitat features are needed for. Much of the information obtained to date in this area is general to elasmobranchs as a group, and is not specific to the Smooth Skate in this DU.

The issue of climate change arose as a major potential threat to this DU (see ToR #17). Participants discussed that mitigating this threat is very complicated.

At this time experts noted that although Smooth Skate have been identified to only exist within a narrow temperature range, they do not necessarily seek these temperatures as this has not been laboratory-tested.

Participants noted that global warming could potentially result in regional cooling in this area, and therefore climate change could pose a risk to the species on either side of its temperature range. The question arose as to whether water temperatures in this DU had been showing a systematic trend one way or the other over the past several decades, and if so whether a clear relationship exists between temperature change and area occupied. It was noted that experiments could be undertaken to investigate further. In addition, participants agreed it would be useful to work with DFO oceanographers to compare temperature plots to a time series of area of occupancy for Smooth Skate.

The Funk Island Deep DU Smooth Skate showed a promising increasing trend through the mid-late 2000s, however survey indices have recently declined and remain at a low level compared to indices from the 1980s. Hopes for a limited recovery based on these increases have not materialized.

Elasmobranch experts at the meeting noted that in terms of habitat requirements, Smooth Skate do not have any known residence requirements (i.e. dens, nests, etc.).

COMMERCIAL FISHERY REMOVALS OF SMOOTH SKATES, 2000-2012

Presenter: Carolyn Miri, DFO Science

Abstract

Commercial fishery removals of Smooth Skate were investigated for 2000-2012. There have been no "directed" fisheries anywhere for this species to date. Catches of Smooth Skate in the Funk Island DU were investigated by fishery by vessel size category using Canadian Fisheries Observers' data and the DFO-NL Zonal Interchange Format (ZIF) database. The bycatch estimation method was based on that of Campana et al. 2011; albeit very low to no Observer coverage precluded use of this method for several fisheries in this DU. Smooth Skate bycatch estimates for the Greenland Halibut fixed gillnet fishery (Vessel Class, VC 1-3) suggested that 1-3 t were caught in 2000-2003, and 5 t in 2010. Bycatch estimates for the Greenland Halibut bottom trawl fishery (VC 4-7) were 0-0.4 t in this time period. Similarly, the shrimp fishery aboard boats of VC 1-3 (using groundfish excluders) seemed to have caught 0-0.5 t; while Smooth Skate bycatch on larger shrimp vessels (VC 4-7) appeared negligible. Pots in the Snow Crab fishery caught almost no Smooth Skate in this DU. Although limited, bycatch estimates suggest that < 0.1 % (of target species' landings) were commercially removed in this DU since the year 2000. Canadian Fisheries Observers constitute the only source of speciated skate catch data and discards at sea (discarding always occurs unreported). At-sea identification of skates remains difficult for commercial fishers, who thus report landings as "skates-unspecified".

Discussion

Participants pointed out that fishery removals can be directly affected by DFO, and are therefore an obvious opportunity for intervention by the department. The presenter pointed out that skates are not currently identified to the species level by fishermen, and that some data holes exist. For example, not every fishery in the area was looked at. A participant commented that the shrimp and turbot fisheries are the biggest and that the observer coverage is high within each. Other fisheries likely play a minor role in this region.

The question arose again regarding spikes in observer data resulting from one or a few large catches, but this did not appear to be the case. This data issue needs to be investigated further.

Participants noted that commercial removals of skate have been low since 2005. The 13 species of skate that are present in the area of the DU make it difficult for fishermen to identify skates to the species level. In addition, the amount of bycatch discarded is unreported and subsequent post-release mortality rates have not been investigated in the area.

The presentation revealed that relative fishing mortality numbers have been near zero in recent years. This likely indicates that commercial removal is not a big factor; however no estimates are available prior to 1995 before the population decline occurred. A time series could be compiled but data before 1995 would not be directly comparable.

A participant asked whether the spatial distribution of fishing had ever been investigated, but no formal studies have been carried out thus far. Distribution of the fisheries is very clustered, and

so it is possible that skate populations could be missed in some years. This spatial component could cause some of the high variability seen in the data, and therefore an investigation into the spatial distribution of observer coverage is warranted. It was noted that a significant overlap exists between the turbot and shrimp fisheries, and that the shrimp fishery has 100 % observer coverage.

The presenter noted that since all smooth skate are discarded, they are not included in the ZIF database on fishery data that is maintained by DFO. Smooth skate are a particularly small species that are not typically profitable for harvest. As a result the only data on Smooth Skate is that being collected by fisheries observers.

Concerns were raised about the ability of observers to properly identify Smooth Skate. It was noted that DFO ensures that observers undergo extensive species identification training and that the Smooth Skate is particularly identifiable among skates. There is no indication of deterioration in observer identification ability, and misidentification rates are negligible.

NAFO catch data were also collected and pro-rated for the observer catch to look at longer-term trends. Data are not available for the entire DU but only for NAFO Divisions 2J and 3K.

Sporadic levels of fishing mortality were present, although they were mostly low throughout the time series. Spikes in data can be attributed in this case to individual sets with high catches, and were left as such in the model used.

It was noted that relative fishing mortality looks high given that catch data is recorded in kilograms, and this needs to be double-checked for the SAR.

One assumption in the model that was necessary because of time constraints was that Smooth and Thorny Skate overlap directly. Participants noted that different fisheries will overlap with Smooth Skate distribution to varying degrees. One critique of the model used was the concern that catches of Smooth Skate were higher for two reasons – higher abundance and higher catchability – and this may have an effect on the conclusions of the model.

BAYESIAN SURPLUS PRODUCTION MODELING

Presenter: Mark Simpson, Section Head – MFSAR, DFO Science

Abstract

Bayesian surplus production models were fit to data for Smooth Skate in the Funk Island Deep Designatable Unit which combines NAFO Div. 2J3K and a portion of NAFO Div. 3L. Input data consisted of: 1) a series of Smooth Skate landings, estimated from NAFO STATLANT21A skate landings prorated for the proportion of Smooth Skate in Observed skate catches in NAFO division 2J3K(1981-2010), 2) an Engel trawl research vessel time series (1981-1994), and 3) a Campelen research trawl time series (1995-2010). Semi-informative priors for intrinsic rate of growth (r) and carrying capacity (K) were provided as input into the model, while Non-informative priors with relatively wide distributions were used for catchability (q), observation and process errors.

Overall model diagnostics, showed a relatively good fit for the model, with good convergence and reasonable posterior distributions. However, concerns on the accuracy of the landings input data and a large process error (twice the observation error), resulted in rejection of the model as a basis to understand and model the population dynamics of Smooth Skate in the Funk Island Deep Designatable unit.

Discussion

It was questioned whether the variables r and K were included in the model as parameters. These values of the priors were included for skates in general and were updated throughout the model (i.e., they were not fixed but estimated in the model).

It was noted that the regime shift in K for this ecosystem (from finfish to invertebrates) was not taken into account in this model, and that the data could potentially be split up into different time periods. When investigating American Plaice (*Hippoglossoides platessoides*), the author experimented with changing r values in a similar model with a very minimal impact on abundance estimates, however this should be case-specific and interesting to look at with Smooth Skate data. It was noted that Winter Skate (*Leucoraja ocellata*) displayed decadal variations in r values.

Participants noted that a normal distribution may not be the most appropriate for catchability, however posteriors were investigated and no signs of constraint emerged. There was also some concern that catchability was assumed to be similar for both the Campelen and Engels trawl gear, which is not the case. The presenter noted that the priors used for this model were semi-informative, and that a lower catchability for the Engels trawl still produces similar posteriors.

A question arose about how a credible limit is defined. These limits can be thought of as confidence intervals – or areas within which the distribution is most likely to fall.

The low levels of fishing mortality observed during the Smooth Skate declines seemed counterintuitive to participants, and indicate that bycatch mortality may not have played a major role in this decline.

A participant noted that on some figures in the presentation the priors do not seem to be well-represented. This may be the result of a problem in the R script, which needs to be investigated further.

The presenter noted that the process error in the model may be large enough to be driving the results. The process error here is not extremely large; however it is about twice the amount of observation error.

Error bars on the figures tend to be very large, and the model consistently fails at predicting where K falls. It was pointed out that fishing mortality to give maximum sustainable yield (FMSY) is extremely low, and that the DU would be vulnerable to even small changes in removal levels.

Clarification is needed with regards to the WINbugs output; is it given in the original scale or sigma? Concern was raised with the results from model 4 and 5; very wide K distributions indicate we may not really know where it lies and whether it has changed over time.

The presenter clarified that process error encompasses all of the unobserved error in the model.

Projections were made at 5, 10, and 15 years for management purposes and at 48 years to encompass three 16-year generations. The credible limits are extremely high as soon as the model starts making predictions which indicates a lack of precision in the model.

The takeaway message from the model projections, if they are deemed useful, is that the chances of recovery to the lower reference point (LRP) in the near future would be extremely low and therefore there is likely not much room for allowable harm.

Participants raised the question of how the gear change would have affected the model, and the presenter noted that this is modeled as a part of the observation error. It was noted that it may be useful to calculate earlier fishing mortality with the model based on observer catch data, however this is a long-term process and not feasible for this RPA.

The biggest decision to be reached by the group in terms of this model is to determine whether it can be reliably used to assess current status or to make projections.

The magnitude of the process error suggests that a 48-year projection is not useful with this model. Although the model has good convergence criteria, the large process error, the uncertainty around the catch data going in, and the large credible intervals make the model imprecise.

At this time the group noted that there were three options for the use of the model in this RPA and the SAR: to take and use the model as presented; to drop the model and base everything on survey trends (allowing only a qualitative assessment of prospects for rebuilding); or to take the model as illustrative in that it shows a low potential for allowable harm.

The group agreed that putting the results table from the model into the document with numbers in it would not be advisable, as people will be quick to draw conclusions from it without heeding caveats. Several experts suggested not using the model in its current state, but including the information in the Research Document.

A number of ideas have been brought forward to improve the model. Although these improvements cannot be made for this meeting they can be investigated in the future.

The group concluded that projections from the model are not to be used. It was noted that this method has worked well for other stocks, and that the modelers should be commended for their efforts.

Survey data will be used throughout the documents to describe the current status and trends for this DU, and qualitative assessments of recovery potential and allowable harm are to be carried out.

DISCUSSION AND REVIEW OF RPA PROTOCOL POINTS

This point in the meeting involved identifying and editing the points to be included as summary bullets in the Science Advisory Report (SAR). Participants pointed out that information about other DUs and information that was general to all DUs was useful for providing context.

SPECIES BIOLOGY AND ECOLOGY

It was recognized that some information in this section regarding the low reproductive potential of the species is important and should be incorporated into a bullet. Information about fishing and environmental effects should be added to the statements about recruitment dynamics.

Participants noted that one of the reasons this DU was established by COSEWIC is the large geographic separation between it and other populations.

The time of spawning paragraph is not to become a summary bullet. Smooth Skate are not likely to be consuming yellowtail flounder in this DU, as it is north of their range. It is interesting that although flounder is eaten, American plaice is not.

Trends show an increase in crustacean abundance during the period of decline in this DU. Stomach content analyses have shown crustaceans to be the preferred food of Smooth Skate, however these analyses have not been carried out specifically in the DU. In addition, stomach content data from before the shift towards crustaceans was not carried out, therefore, what appears to be a food preference could potentially be a reflection of abundance and availability.

Participants noted that this section is largely based on generic Smooth Skate information as opposed to the specific DU.

Temperature and depth ranges (1-4 °C and 200-600 m) were discussed and it was agreed that this would need to be included as a bullet.

It was noted that COSEWIC considers the population the designatable unit, rather than a geographic area. Wording throughout the document needs to be modified to reflect this.

ASSESSMENT – STATUS AND TRENDS

Participants agreed that a simplified statement on trends was needed to open the section; numbers declined until the mid-1990's and have remained low since. The small increase in 2010 was likely insignificant, as the population has returned to the low levels that have been the status quo since the mid-1990's.

The group expressed concern that text regarding skates avoiding trawl nets may cast unwarranted doubt on low survey estimates. This should instead be included in the 'Areas of Uncertainty' section. The catchability may have changed with the gear changes that occurred, however the decline occurred mostly prior to the gear change.

It was noted that the term 'relative abundance' needs to be changed to 'abundance index' throughout the documents.

With regards to the figures in this section, the DFO standard for referring to multiple figures in the text needs to be clarified. The maps in Figure 4 are in need of a change in scale, and the dots need to be made hollow so that overlapping dots are visible.

The significant decline in area of occupancy for this DU warrants a figure and some associated text in the SAR. Participants expressed desire to have the DU labeled on Figure 1 and to have the Hawke Channel labeled on Figure 4 of the document.

HABITAT REQUIREMENTS AND CONSIDERATIONS

All studies carried out on habitat preferences have been general to all Smooth Skate DUs.

Smooth Skate do not have a residency requirement, and egg cases are generally found in the same areas as adults (i.e. no separate nursery grounds). Some depth separation between juveniles and adults occurs in the Laurentian Channel. Juveniles are usually found deeper, however significant overlap exists.

There exists a correlation between depth and temperature. Depth has been studied but not temperature, and there may be different temperature preferences for adults and juveniles.

Some concern was raised about discussing 'research surveys' in the text, as this may lead the reader to believe that research surveys were undertaken specifically to study smooth skate. The surveys discussed here are DFO multi-species surveys.

SPATIAL EXTENT OF HABITAT

Participants discussed the fact that adults were once widespread in the area, but now occupy a much smaller percentage of it. It was noted that Smooth Skate are not highly mobile and therefore small-scale information is important and microhabitat may play a significant role.

The area of occupancy has averaged around 7.5 % as of late, down from a peak of 38 % in 1982. This represents a significant contraction to a few key areas. It was noted that it is not clear whether habitat destruction caused this decline or if Smooth Skate simply moved to preferred habitat. If a recovery occurs the area of occupancy may expand again without any specific habitat restoration work.

The data indicates that more suitable temperatures exist in the area now than before, and that there could be a lag response and hence no signs of increased numbers yet.

The group agreed that in general, more information is needed about the relevant spatial scale at which to identify Smooth Skate habitat.

POTENTIAL THREATS TO HABITAT AND ASSOCIATED IMPACTS

Fishing

The group recognized a need to acknowledge the different level of impact that can occur on different seabed substrates.

Vessel traffic

Typical vessel traffic would not affect such bottom-dwelling species, however dumping, spills, etc., do have some potential to cause harm. The group agreed that vessel traffic is low enough in the area that this section is not necessary.

Seismic Surveys

Seismic surveys would not affect benthic habitat with the exception of effects on the 'appropriate acoustic environment' for the species, of which not much is known for Smooth Skate. These surveys could have impacts on other species in the food chain that Smooth Skate may rely on, directly or indirectly. Some prey species may have life history stages that could be affected.

The group agreed that it may be useful to get advice from acoustic experts with experience in seismic impacts.

Oil and Gas Drilling

Although no direct oil and gas exploration occurs in this DU, the prevailing current would bring spilled material into the region. This may only be relevant if dispersants are used, which would cause the oil to sink to the benthos and be detrimental to natural oil-consuming bacteria. Floating oil slicks could also impact prey species. This section would also benefit from being reviewed by someone with expertise in this area

Climate Change

The impacts of climate change on Smooth Skate are likely to be important given the narrow temperature range of this species. Local and regional cooling or warming would have effects on the population.

Participants noted that regime shifts should be discussed somewhere; possibly in this section. Climate change could have major food web impacts which would directly affect this DU. Participants noted that trends may indicate an increase in the crustacean: fish ratio in the diet of Smooth Skate, which may have been a factor in the decline.

It was noted that impacts of invasive species may increase with climate change. Text describing these impacts may be available from RPA documents for different species.

Spatial configuration constraints

It was clarified that this section is referring to within this DU, and that COSEWIC formulated the DUs based on spatial constraints. It is not likely that any sort of rescue effect would occur because of the limited dispersal capabilities of individuals from other DUs.

No genetic work has been done to date on this species, but records of skate between DUs is either extremely rare or completely absent. Some temperatures within the DUs seem suitable; however no work has been carried out in this area.

The causes of the prominent geographic barriers to Smooth Skate dispersal off the coast of Newfoundland are not clear.

Quantity/Quality of Suitable Habitat

Information in this section is to be included as a bullet in the SAR. Although area of occupancy has declined, it is not clear whether a loss of habitat is associated with this decreased distribution.

Feasibility of Habitat Restoration

This is an area of significant uncertainty, as all that is known about Smooth Skate habitat at this point are temperature and depth preferences.

Habitat Allocation Decisions

This section deals with particularly important habitat areas within the area of the DU. Given the limited state of knowledge about Smooth Skate habitat, it is not clear that any subset of the area is more suitable than others.

The group noted that it is difficult to make statements in this section without having identified critical habitat. However, temperature and depth preferences should be taken into account when habitat allocation decisions are being made.

The risks associated with habitat allocation decisions have not been evaluated for this DU.

Threats to Survival and Limiting Factors for Recovery

Participants noted the importance of providing information about threats to the ecosystem in addition to information specific to Smooth Skate for this section.

Recruitment

Participants voiced concern over the use of the term 'K-selected' in the SAR given the technicality of it, and agreed that it may not be suitable content for the SAR but should be included in the research document.

Experts discussed the idea of low reproductive rates leading to low intrinsic growth rates (r), a statement which is often made in the literature regarding elasmobranch species. Although they do not have a high fecundity, a lot is invested into each egg case and so high survival of juveniles plays a big role in many cases. For example, dogfish were at their lowest levels in 1999, and now in 2013 record numbers have been recorded.

Slow ontogeny and late reproduction also play a significant role in population growth. The group agreed not to mention 'inherently low growth rate' in the documents.

Interspecific interactions

It was again noted that crustaceans increased during the decline of Smooth Skate, however the lack of dietary studies prior to this regime shift make conclusions difficult.

Mortality

Participants pointed out that all predation observations on Smooth Skate occurred in other DUs.

Discussion on the low estimated fishing mortality led some participants to consider assuming high natural mortality during the decline. Fishing mortality estimates have a lot of associated uncertainty, so assuming that fishing was not a significant factor may be misguided given the vulnerability of Smooth Skate to even low levels of fishing.

Although total mortality was high during the decline, it is not possible to distinguish between natural and fishing mortality at this point.

PARAMETER RECOMMENDATIONS AND RECOVERY TARGETS

A Precautionary Approach (PA) framework was used for this section, but with the lack of a quantitative model in this case other proxies need to be used as surrogates. The gear change that occurred on research vessels makes a maximum sustainable yield (MSY) proxy difficult; however a correction factor has been applied to account for the higher catchability with the Campelen trawl. Given the lack of data and quantitative model in this case, interim limit reference points are needed.

This DU has remained at approximately 18 % of the LRP over the last five years. The MSY proxy used seems to fall in the middle of the areas of high abundance in the time series, which seems appropriate. It was noted that these estimates are minimums given the bottom-dwelling nature and low catchability of the species. This should not be an issue as long as catchability remains constant in the years to come.

The group agreed that this section warrants a summary bullet in the SAR.

MITIGATION

The low level of bycatch associated with this DU indicates that the only fisheries mitigation that could be applied here would be the closure of a fishery. This could potentially be a decision if Smooth Skate were to be listed under SARA.

Although mandatory logbooks aboard vessels have been insufficient in the past, monitoring the fishery needs to be part of mitigation. This would include further bycatch observer coverage and dockside monitoring. Fisheries could be closed in particular areas that are recognized as important to Smooth Skate.

The group agreed that mitigating natural predation mortality is not likely an option at this time given that it has not been quantified.

ALLOWABLE HARM ASSESSMENT

It is currently the case that under extremely low fishing mortality, Smooth Skate recovery has not occurred for this DU. This indicates that there is very little room for allowable harm to the species.

Participants noted that future impacts of oil and gas activity should be mentioned.

The group expressed concern that current fishing levels are not causing further decline. It was also noted that no further decline has occurred over three generations, and that this could potentially be a criterion for delisting. COSEWIC however does not currently have any delisting criteria, so it is not clear that this would be the case.

It is not clear at this time whether the population would begin to recover without this level of bycatch being taken.

SOURCES OF UNCERTAINTY

The group recognized a need to be clear that uncertainties exist about reasons for decline, not the relative population size.

Climate change is likely one of the biggest threats in addition to being the biggest source of uncertainty.

The lack of a quantitative population model restricts the ability to make projections and set recovery targets. In addition, the entire suite of life history traits specific to this DU has not been characterized, leaving no biological parameters to feed into models.

Information on the relevant spatial scale to determine Smooth Skate habitat requirements is not currently available.

More information is needed regarding trophic interactions that may be important for the trajectory of this DU.

REFERENCES CITED

Campana, S.E., Brading, J., and Joyce, W. 2011. Estimation of Pelagic Shark Bycatch and Associated Mortality in Canadian Atlantic Fisheries. DFO Can. Sci. Advis. Sec. Res. Doc. 2011/067. vi+19 p.

APPENDIX 1. TERMS OF REFERENCE

Recovery Potential Assessment for Smooth Skate (Funk Island Deep Designatable Unit)

Regional Peer Review Meeting – Newfoundland and Labrador Region

Date May 1-2, 2013
Location St. John's, NL

Chairperson: Joanne Morgan

Context

When the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designates aquatic species as threatened or endangered, Fisheries and Oceans Canada (DFO), as the responsible jurisdiction under the *Species at Risk Act* (SARA), is required to undertake a number of actions. Many of these actions require scientific information on the current status of the Smooth Skate (Funk Island Deep DU), threats to its survival and recovery, and the feasibility of its recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for the consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

The Committee on the Status of Endangered Wildlife in Canada has designated the Smooth Skate, Funk Island Deep DU (May 2012) as Endangered (COSEWIC 2012). This species is not currently listed under the *Species at Risk Act* (SARA).

In support of listing recommendations for this Smooth Skate (Funk Island Deep DU) by the Minister, DFO Science has been asked to undertake an RPA, based on the National Frameworks (DFO 2007a and b). The advice in the RPA may be used to inform both scientific and socio-economic elements of the listing decision, as well as development of a recovery strategy and action plan, and to support decision-making with regards to the issuance of permits, agreements and related conditions, as per section 73, 74, 75, 77 and 78 of SARA. The advice generated via this process will also update and/or consolidate any existing advice regarding this Smooth Skate (Funk Island Deep DU).

Objectives

- To assess the recovery potential of Smooth Skate (Funk Island Deep DU).

Assess current/recent species/ status

1. Evaluate present status for abundance and range and number of populations.
2. Evaluate recent species trajectory for abundance (i.e., numbers and biomass focusing on mature individuals) and range and number of populations.
3. Estimate, to the extent that information allows, the current or recent life-history parameters (total mortality, natural mortality, fecundity, maturity, recruitment, etc.) or reasonable surrogates; and associated uncertainties for all parameters.
4. Estimate expected population and distribution targets for recovery, according to DFO guidelines (DFO 2005, and 2011).
5. Project expected population trajectories over three generations (or other biologically reasonable time), and trajectories over time to the recovery target (if possible to achieve), given current parameters for population dynamics and associated uncertainties using DFO guidelines on long-term projections (Shelton *et al.* 2007).
6. Evaluate **residence requirements** for the species, if any.

Assess the Habitat Use

7. Provide functional descriptions (as defined in DFO 2007) of the required properties of the aquatic habitat for successful completion of all life-history stages.
8. Provide information on the spatial extent of the areas that are likely to have these habitat properties.
9. Identify the activities most likely to threaten the habitat properties that give the sites their value, and provide information on the extent and consequences of these activities.
10. Quantify how the biological function(s) that specific habitat feature(s) provide to the species varies with the state or amount of the habitat, including carrying capacity limits, if any.
11. Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.
12. Provide advice on how much habitat of various qualities / properties exists at present.
13. Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present, and when the species reaches biologically based recovery targets for abundance and range and number of populations.
14. Provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached, in the context of all available options for achieving recovery targets for population size and range.
15. Provide advice on risks associated with habitat "allocation" decisions, if any options would be available at the time when specific areas are designated as critical habitat.
16. Provide advice on the extent to which various threats can alter the quality and/or quantity of habitat that is available.

Scope for Management to Facilitate Recovery

17. Assess the probability that the recovery targets can be achieved under current rates of parameters for population dynamics, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.
18. Quantify to the extent possible the magnitude of each major potential source of mortality identified in the pre-COSEWIC assessment, the COSEWIC Status Report, information from DFO sectors, and other sources.
19. Quantify to the extent possible the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets.
20. Assess to the extent possible the magnitude by which current threats to habitats have reduced habitat quantity and quality.

Scenarios for Mitigation and Alternative to Activities

21. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all feasible measures to minimize/mitigate the impacts of activities that are threats to the species and its habitat (steps 18 and 20).
22. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all reasonable alternatives to the activities that are threats to the species and its habitat (steps 18 and 20).
23. Using input from all DFO sectors and other sources as appropriate, develop an inventory of activities that could increase the productivity or survivorship parameters (steps 3 and 17).

24. Estimate, to the extent possible, the reduction in mortality rate expected by each of the mitigation measures in step 21 or alternatives in step 22 and the increase in productivity or survivorship associated with each measure in step 23.
25. Project expected population trajectory (and uncertainties) over three generations (or other biologically reasonable time), and to the time of reaching recovery targets when recovery is feasible; given mortality rates and productivities associated with specific scenarios identified for exploration (as above). Include scenarios which provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.
26. Recommend parameter values for population productivity and starting mortality rates, and where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts of listing the species.

Allowable Harm Assessment

27. Evaluate maximum human-induced mortality which the species can sustain and not jeopardize survival or recovery of the species.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document

Participation

- Fisheries and Oceans Canada Science, Ecosystems and Fisheries Management, Oceans, Habitat and Species at Risk, Policy and Economics
- Province of Newfoundland and Labrador
- Aboriginal Communities
- Fishing Industry
- Non-governmental organizations
- Other Stakeholders

References

COSEWIC. 2012. COSEWIC assessment and status report on the Smooth Skate *Malacoraja senta* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. (Species at Risk Public Registry)

DFO. 2007. Documenting habitat use of species at risk and quantifying habitat quality. DFO. Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/038.

Shelton, P.A., B. Best, A. Cass, C. Cyr, D. Duplisea, J. Gibson, M. Hammill, S. Khwaja, M. Koops, K. Martin, B. O'Boyle, J. Rice, A. Sinclair, K. Smedbol, D. Swain, L. Velez-Espino, and C. Wood. 2007. Assessing recovery potential: long-term projections and their implications for socio-economic analysis. DFO. Can. Sci. Advis. Sec. Res.Doc. 2007/045.

APPENDIX 2. PARTICIPANTS

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APPENDIX 3. AGENDA

Zonal Advisory Meeting

Recovery Potential Assessment of Smooth Skate

May 1-2, 2013

Holiday Inn, St. John's, NL

Chairperson: Joanne Morgan

Wednesday, May 1		
09:00 – 09:15	Opening Remarks	Joanne Morgan (Chair)
09:15 – 09:30	Review of RPA process	Joanne Morgan
09:30 – 09:45	Review of biology/life history of Smooth Skate in relation to RPA criteria	Roanne Collins
09:45 – 10:15	Review of survey indices	Roanne Collins
10:15 – 10:30	Review of fishery statistics and landings in relation to "Threats"	Carolyn Miri
10:30 – 10:45	BREAK (Coffee/tea will be provided)	
10:45 – 12:00	Review of population models	Mark Simpson
12:00 – 13:00	LUNCH (Not Provided)	
13:00 – 14:30	Discussion and review of RPA protocol points (SAR drafting)	All
14:30 – 14:45	BREAK (Coffee/tea will be provided)	
14:45 – 16:30	Discussion and review of RPA protocol points (SAR drafting)	All
16:30	Adjournment	

Thursday, May 2		
09:00 – 09:15	Opening Remarks	Chair
09:15 – 10:30	Discussion and review of RPA protocol points (SAR drafting)	All
10:30 – 10:45	BREAK (Coffee/tea will be provided)	
10:45 – 12:00	Discussion and review of RPA protocol points (SAR drafting)	All
12:00 – 13:00	LUNCH (Not Provided)	
13:00 – 14:30	Discussion and review of RPA protocol points (SAR drafting)	All
14:30 – 14:45	BREAK (Coffee/tea will be provided)	
14:45 – 16:30	Discussion and review of RPA protocol points (SAR drafting)	All
16:30	Adjournment	